APPENDIX E

GEOTECHNICAL EVALUATION REPORT & ADDENDUM NO. 1

GEOTECHNICAL EVALUATION REPORT

Western Technologies Inc.

GEOTECHNICAL EVALUATION REPORT

CAMPO VERDE PHASE I AND PHASE II ENERGY STORAGE PROJECT
1148 Leibert Road
El Centro, California
WT Reference No. 2126XT095

PREPARED FOR:
Renewable Energy Systems Americas, Inc. (RES)
11101 West 120th Avenue
Broomfield, CO 80021
Attn: Brendan D. Miller, P.E.

Revised on September 26, 2016

9-26-16

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EXECUTIVE SUMMARY

A subsurface exploration and geotechnical evaluation has been made on the site for the Campo Verde Phase I and Phase II Energy Storage Project. Four soil test borings have been drilled and soil samples submitted to laboratory tests. The data has been carefully analyzed in light of the project information provided by Renewable Energy Systems Americas, Inc. (RES).

The site consists of an existing solar farm facility including large and small transformer pads and office building. The ground surface. The soils below the surface layer consist of Dense Silty SAND and stiff to very stiff Sandy CLAY. The near surface soils are non-plastic to low plasticity and were found to be of low expansive potential. Groundwater was encountered in two borings at a depth of 11 to 16 feet below the existing ground surface.

The structures for the planned Phase I and Phase II of the Energy Storage Project can be supported by shallow foundation using spread footings to a minimum depth of 18 inches below the lowest finished exterior grade with a maximum allowable bearing capacity of 2,500 psf. Additional net allowable bearing pressures have been provided in the body of the report for design. Minimum footing width is 16 inches.

In slab areas, scarify, moisten or dry as required, and compact all subgrade soils to a minimum depth of 10 inches. The subgrade preparation is to be accomplished in a manner that will result in uniform water contents and densities after compaction.

Laboratory minimum resistivity and pH tests were conducted on samples of the site soils. The results indicate that the site soils, especially when of elevated moisture content, are potentially corrosive to buried ferrous metals. Therefore, special protection may be warranted for buried metal piping or other conduits that would be in contact with the native soils. A corrosion expert should be part of the project design team to prepare recommendations for corrosion protection of buried utilizes and conduits.

A review of available geologic records indicates that no active faults cross the proposed project site. According to information published by the United States Geologic Survey, the Imperial Fault, located about 12 miles east of the site, is capable of producing a Magnitude 7.0 earthquake. The Elsinore Fault, (Laguna Salada section) is the nearest active fault zone and is about 5 miles west of the south. This fault zone is capable of producing earthquakes of Magnitude 7.5.

The total post-liquefaction settlement is estimated to vary from 0 to ½ inch at the site with ¼ inch post-liquefaction differential settlement. These values should be used for structural design of this project.

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GEOTECHNICAL EVALUATION
CAMPO VERDE PHASE I ENERGY STORAGE PROJECT
1148 LIEBERT ROAD
EL CENTRO, CALIFORNIA
WT NO. 2126XT095

1.0 PURPOSE

This report contains the results of our geotechnical evaluation for Phase I and Phase II of the planned Energy Storage Project, and was performed in general accordance with our contract. The purpose of our services is to provide information and recommendations regarding:

- Subsurface conditions
- Foundation design parameters
- Lateral earth pressures
- Seismic considerations
- Slabs-on-grade
- Drainage
- Corrosivity
- Excavation conditions
- Earthwork, including site preparation, fill placement, and suitability of existing soils for fill materials, and compaction

WT and EGA Consultants previously conducted a geotechnical evaluation of the entire solar farm facility. WT used information from the previous evaluations for this report. WT performed additional field exploration, field and laboratory tests and results are presented in the Appendices.

2.0 PROJECT DESCRIPTION

Based on information provided, Phase I and Phase II of the project will consist of outdoor electrical equipment to be used for battery storage within the Campo Verde Solar Project. The equipment includes a battery container, power conversion system, transformers, switchgear, IT equipment, and power distribution panels. It is our understanding that the prefabricated containers containing batteries and/or inverters and other electrical equipment will weight an estimated 90,000 pounds per container and be supported at 8 points with the heaviest loaded point supporting approximately 15,000 pounds. Concrete slabs will be constructed for electrical equipment with maximum weights of 600 psf including weight with a minimum pad area of 16 square feet. Additional exploratory soil borings, laboratory soil testing and geotechnical report has been requested to provide foundation and site design recommendations. Final site grading plans were

not available at the time of preparation of this report. Should our assumptions not be correct, we should be notified immediately.

3.0 SCOPE OF SERVICES

3.1 Document Review

WT reviewed its previous geotechnical exploration report titled *Geotechnical Evaluation, Campo Verde Solar, SWC of Interstate HWY 8 and County HWY S29, Imperial County, California* ("WT Report" – WT Job No. 2121JF157, dated April 10, 2012). The original Geotechnical Report provided foundation, earthwork, electrical and thermal resistivity, and particulate emission potential. WT reviewed the previous report, and WT used the data and recommendations generated for the report for the Battery Energy Storage System within the Campo Verde Solar Project.

WT reviewed a previous preliminary geotechnical exploration performed by Engineering Geotechnical Applications (EGA) Consultants, titled *Preliminary Geotechnical Investigation, Proposed Mount Signal Solar Farm and Associated Structures, West of Drew Road and South of Interstate 8, Imperial County, California* ("EGA Report" –Project No. TS646.1, dated June, 2011). The EGA Preliminary Geotechnical Report provided geological hazards, foundation, earthwork, and electrical and thermal resistivity data and recommendations. WT reviewed the previous report, and used the geological hazards data and recommendations generated for the report for the Battery Energy Storage System within the Campo Verde Solar Project.

3.2 Field Exploration

Two borings were drilled to a depth of approximately 11½ to 16½ feet below existing site grade in the Phase I and Phase II of the Energy Storage Project area. In addition, two borings were drilled to a depth of 5 feet below existing site grade in the proposed electrical equipment concrete slab areas. The borings were at the approximate location shown on the attached Boring Location Diagram. A field logs were prepared for each boring. The logs contain visual classifications of the materials encountered during drilling as well as interpolation of the subsurface conditions between samples. The final logs, included in Appendix A, represents our interpretation of the field logs and may include modifications based on laboratory observations and tests of the field samples. The final logs describes the materials encountered, their thicknesses, and the locations where samples were obtained.

The Unified Soil Classification System was used to classify soils. The soil classification symbols appear on the boring logs and are briefly described in Appendix A. Local and regional geologic characteristics were used to estimate the seismic design criteria.

3.3 Laboratory Analyses

Laboratory analyses were performed on representative soil samples to aid in material classification and to estimate pertinent engineering properties of the on-site soils for preparation of this report. The following tests were performed in general accordance with applicable procedures, and the results are presented in Appendix B.

- Field moisture content
- In-situ soil density
- Maximum density-optimum moisture relationship
- Expansion Index
- Compression potential
- Sieve analysis
- Liquid Limit and Plasticity Index
- pH and minimum resistivity
- Water soluble chloride and sulfate content

3.4 Analyses and Report

This geotechnical engineering report includes a description of the project, a discussion of the field and laboratory testing programs, a discussion of the subsurface conditions, and design recommendations as appropriate to its purpose. The scope of services does not include any environmental assessment of the site, discovery of UST's or other underground structures, or identification of contaminated or hazardous materials or conditions. If the Client is concerned about the possibility of such contamination, WT is available to discuss the scope and further studies.

4.0 SITE CONDITIONS

4.1 Surface

At the time of WT's exploration, the site was an existing solar farm facility including large and small transformer pads and office building. The ground surface was relatively flat and contained a light growth of grasses and weeds. Site drainage trended to the northeast as sheet surface flow.

4.2 Subsurface

As presented on borings logs, surface soils to full depth of exploration consist of dense Silty SAND and stiff to very stiff Sandy CLAY. The near surface soils are non-plastic to low plasticity. A detailed description of the soils encountered can be found on the boring logs in Appendix A.

4.3 Groundwater

Groundwater was encountered in Borings 1 and 2 at a depth of 11 to 16 feet below existing site grade at the time of exploration. These observations represent the groundwater conditions at the time of measurements and may not be indicative of other times. Groundwater levels can be expected to fluctuate with varying seasonal and weather conditions, groundwater withdrawal and recharge, local farm and irrigation practices, and future development.

4.4 Geology

The Imperial Valley (also known as the Salton Sink, the Salton Basin, and the Salton Trough) is an extension of the Gulf of California, cut off from the Gulf by the Colorado River's delta fan (USGS, 2007). The valley basin consists of lacustrine sedimentary fill of sands, clays, and gravels derived from Colorado River mud ranging up to 15,000 feet in thickness. The layers slope gently down-valley, and contain several important aquifers.

The valley is also laced with major members of the San Andreas Fault system (Singer, 2005). A review of available geologic records indicates that no active faults cross the proposed project site. According to information published by the United States Geologic Survey, the Imperial Fault, located about 12 miles east of the site, is capable of producing a Magnitude 7.0 earthquake. The Elsinore Fault, (Laguna Salada section) is the nearest active fault zone and is about 5 miles west of the south. This fault zone is capable of producing earthquakes of Magnitude 7.5.

Surface rupture is the result of movement on an active fault reaching the surface. The site is not mapped within an earthquake fault zone according to the Aloquist-Priolo maps and no evidence of active faulting was found at the referenced project site during WT's investigation. Therefore, surface rupture is not considered to be a substantial geological hazard at this time.

4.4.1 Liquefaction

Liquefaction of soils can be caused by strong vibratory motion in response to earthquakes. Research and historical data indicate saturated loose, granular soils are susceptible to liquefaction, whereas cohesive soils such as clays, are not adversely affected by vibratory motion. The previous EGA Report performed a liquefaction analysis for the entire solar farm facility. Their analysis indicated that sandy zones down to a depth of 50 feet may liquefy. The total post-liquefaction settlement is estimated to vary from 0 to ½ inch at the site with ¼ inch post-liquefaction differential settlement. These values should be used for structural design of this project.

4.4.2 Other Geological Hazards

Other geological hazards such as landsliding are not applicable at the proposed project or adjacent sites. The site has no significant potential for soil landslides and lateral spreading.

5.0 GEOTECHNICAL PROPERTIES & ANALYSIS

5.1 Laboratory Tests

Near surface soils are non-plastic to low plasticity. A test performed in accordance with ASTM D4829 (Standard Test Method for Expansion Index of Soils), resulted in an expansion index (EI) value of 0 and may be characterized as low expansive per the 2012 International Building Code (IBC). Slabs-on-grade supported on recompacted on-site soils have a nil potential for heaving if the water content of the soil increases. Slabs-on-grade may be supported on properly prepared on-site soil.

Chemical tests were performed on a representative sample of on-site soils to determine the amount of water-soluble sulfates and chlorides. The test results indicate that the soils would be classified as negligibly corrosive to concrete. The test was performed by Arizona Department of Transportation methods and the result is presented in Appendix B.

Laboratory minimum resistivity and pH tests were conducted on a sample of the site soils. The pH of the soils tested was 8.5, which is in the range of typical values for desert soils. Minimum resistivity values of 514 and 934 ohm-cm were obtained and indicates that the site soils, especially when of elevated moisture content, are potentially corrosive to buried ferrous metals.

5.2 Field Tests

Existing subsoils near shallow foundation level exhibited moderate resistance to penetration using test method ASTM D3550. This corresponds to a moderate bearing capacity for existing soils in their present condition.

The boring logs included in this report are indicators of subsurface conditions only at the specific location and date noted. Variations from the field conditions represented by the boring may become evident during construction. If variations appear, WT should be contacted to re-evaluate our recommendations.

6.0 RECOMMENDATIONS

6.1 General

Recommendations contained in this report are based on our understanding of the project criteria described in **Section 2.0**, and the assumption that the soil and subsurface conditions are those disclosed by the boring. Others may change the plans, final elevations, number and type of structures, foundation loads, and floor levels during design or construction. Substantially different subsurface conditions from those described herein may be encountered or become known. Any changes in the project criteria or subsurface conditions shall be brought to WT's attention in writing. This report does not encompass the effects, if any, of underlying geologic hazards or regional groundwater withdrawal and expresses no opinion regarding their effects on surface movements at the project site.

6.2 Shallow Foundations

The proposed structures for the planned Phase I and Phase II of the Energy Storage Project can be supported by shallow spread foundations bearing on undisturbed dense native soil and/or properly compacted engineered fill.

Alternative footing depths and allowable bearing capacities are presented in the following tabulation:

Footing Depth Below Finished Grade (ft) [1]	Allowable Bearing Capacity (psf)
1.5	2000
2.0	2500

[1] Finished grade is the lowest adjacent grade for perimeter footings and floor level for interior footings.

WT anticipates that differential settlement of the proposed structures for the planned Phase I and Phase II of the Energy Storage Project, supported as recommended, should be less than ¾ of an inch. Additional foundation movements could occur if water from any source infiltrates the foundation soils. Therefore, proper drainage, as recommended in Section 6.6 of this report, should be provided in the final design and during construction.

The allowable bearing capacities apply to dead loads plus design live load conditions. Recommended minimum widths of column and wall footings are 24 inches and 16 inches, respectively. A one-third increase in the bearing capacity is allowable for wind or seismic loads. The bearing capacities given are net bearing capacities and the weight of the concrete in the footings may be ignored.

All footings should be reinforced to reduce the potential for distress caused by differential foundation movements.

WT recommends that the geotechnical engineer or geotechnical engineer's representative observe the footing excavations before reinforcing steel and concrete are placed. This observation is to assess whether the soils exposed are similar to those anticipated for support of the footings. Any soft, loose or unacceptable soils should be undercut to suitable materials and backfilled with approved fill materials or lean concrete. Soil backfill should be properly compacted.

6.3 Slab-on-Grade Support

Slabs-on-grade can be supported on properly placed and compacted fill or approved on-site soils. For design, WT recommends using a modulus of subgrade reaction (k) of 225 pounds per cubic inch (pci) for the on-site soil and imported fill material based on the soil classification. The slab subgrade should be prepared by the procedures outlined in the **EARTHWORK** section of this report. A minimum 4-inch layer of base course should be provided beneath all slabs to help prevent capillary rise and a damp slab.

All concrete placement and curing operations should follow the American Concrete Institute manual recommendations. Improper curing techniques and/or high slump (high water-cement ratio) could cause excessive shrinkage, cracking or curling. Concrete slabs should be allowed to cure adequately before placing vinyl or other moisture sensitive floor covering.

6.4 Lateral Design Criteria

Lateral loads may be resisted by concrete interface friction and by passive resistance. For shallow foundations bearing on undisturbed native soil and/or properly compacted fill at this site, WT recommends the following lateral resistance criteria:

- Passive:
  Shallow wall footings.....300 psf/ft
  Shallow column footings.....450 psf/ft

- Coefficient of base friction.....0.45
- Coefficient of base friction when combined with passive pressure.....0.35

6.5 Seismic Considerations

For structural designs based upon the 2012 International Building Code, the following criteria will apply. The soil site class is D. S_s, the spectral acceleration for short periods, is 1.500g. S_1, the spectral acceleration for a 1-second period, is 0.600g. F_a and F_v, in accordance with Table 1613.3.3(1) and 1613.3.3(2) are 1.000 and 1.500, respectively.

6.6 Drainage

A cause of soil problems in this vicinity is moisture increase in soils below structures. Therefore, it is extremely important that finished grades should slope down and away from the structures during construction and maintained throughout the life of the proposed Phase I and Phase II of the Energy Storage System Project. Infiltration of water into utility or foundation excavations must be prevented during construction.

In areas where sidewalks or paving do not immediately adjoin the structures of the proposed Phase I and Phase II of the Energy Storage System Project, protective slopes should be provided with an outfall of 5 percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility trenches should be well compacted and free of all construction debris to minimize the possibility of moisture infiltration.

6.7 Corrosivity to Concrete

The chemical test results indicate that the soils at the site classify as "Not Applicable (S0)" in accordance with Table 4.2.1 of ACI 318-11. However, in order to be consistent with standard local practice and for reasons of material availability, WT recommends that Type II Portland cement be used for all concrete on and below grade.

6.7.1 Metals

Laboratory minimum resistivity and pH tests were conducted on samples of the site soils. The results indicate that the site soils, especially when of elevated moisture content, are potentially corrosive to buried ferrous metals. Therefore, special protection may be warranted for buried metal piping or other conduits that would be in contact with the native soils. In addition, special protection may be necessary where dissimilar metals are placed in close proximity or are joined. A corrosion expert should be part of the project design team to prepare recommendations for corrosion protection of buried utilizes and conduits.

7.0 EARTHWORK

7.1 General

The validity of the conclusions contained in this report is based on compliance with the recommendations presented in this section. Any excavating, trenching, or disturbance that occurs after completion of the earthwork must be backfilled, compacted and tested in accordance with the recommendations contained herein. If any unobserved and untested earthwork, trenching, or backfilling occurs, then the conclusions and recommendations in this report may not be relied on.

Although fills or underground facilities such as septic tanks, cesspools, utilities, and dry wells were not observed, such features might be encountered during construction. These features should be handled in accordance with the recommendations of the geotechnical engineer and/or any applicable regulatory requirements. Any loose or disturbed soils resulting from demolition of unknown utilities should be removed or recompacted as engineered fill and any excavations should be backfilled in accordance with recommendations presented herein.

7.2 Site Clearing

Strip and remove existing vegetation, debris, and any other deleterious materials from the structure areas. The structure area is defined as that area within the building footprint plus 5 feet beyond the perimeter of the footprint. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.

7.3 Excavation

WT anticipates that excavations for shallow foundations and utility trenches for the proposed construction can be accomplished with conventional equipment.

Soil classifications are based solely on the materials encountered in the exploratory test boring. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are found at the time of construction, WT should be contacted immediately to evaluate the conditions encountered.

7.4 Foundation Preparation

Specialized treatment of existing soils within foundation areas is not required. Footings should bear upon undisturbed on-site soils.

7.5 Slab Preparation

Scarify, moisten or dry as required, and compact all subgrade soils to a minimum depth of 10 inches. The subgrade preparation is to be accomplished in a manner that will result in uniform water contents and densities after compaction.

7.6 Materials

Clean on-site native soils or imported materials may be used as fill material for the following:

- Foundation areas
- Slab areas
- Backfill

Imported soils should conform to the following:

- Gradation (ASTM C136):

	percent finer by weight
6"	100
4"	85-100
¾"	70-100
No. 4 Sieve	50-100
No. 200 Sieve	50 (max)

- Maximum Expansion Index 20
- Maximum expansive potential (%)* 1.5
- Maximum soluble sulfates (%) 0.10

* Measured on a sample compacted to approximately 95 percent of the ASTM D698/AASHTO T99 maximum dry density at two percent below optimum water content. The sample is confined under a 144 psf surcharge and submerged.

7.7 Placement and Compaction

a. Place and compact fill in horizontal lifts, using equipment and procedures that will produce recommended water contents and densities throughout the lift.
b. Uncompacted fill lifts should not exceed 10 inches.
c. Materials should be compacted to the following:

Material	Minimum Percent Compaction (ASTM D1557)
On-site and imported soil, reworked and fill:	
Below footings	90
Below slabs-on-grade	90
Aggregate base below slabs-on-grade	95
Nonstructural backfill	90

Imported and on-site soils should be compacted within a water content range of two percent below to three percent above optimum.

7.8 Compliance

Recommendations for slabs-on-grade and foundations elements supported on compacted fills or prepared subgrade depend upon compliance with **EARTHWORK** recommendations. To assess compliance, observation and testing should be performed under the direction of a geotechnical engineer.

8.0 LIMITATIONS

This report has been prepared assuming the project criteria described in **Section 2.0**. If changes in the project criteria occur, or if different subsurface conditions are encountered or become known, the conclusions and recommendations presented herein shall become invalid. In any such event, WT should be contacted in order to assess the effect that such variations may have on our conclusions and recommendations.

The recommendations presented are based entirely upon data derived from a limited number of samples obtained from the widely spaced borings. The attached logs are an indicator of subsurface conditions only at the specific location and times noted. This report assumes the uniformity of the geology and soil structure within the borings, however variations can and often do exist. Whenever any deviation, difference or change is encountered or becomes known, WT should be contacted.

This report is for the exclusive benefit of our client alone. There are no intended third-party beneficiaries of our contract with the client or this report and nothing contained in the contract or this report shall create any express or implied contractual or any other relationship with, or claim or cause of action for, any third party against WT.

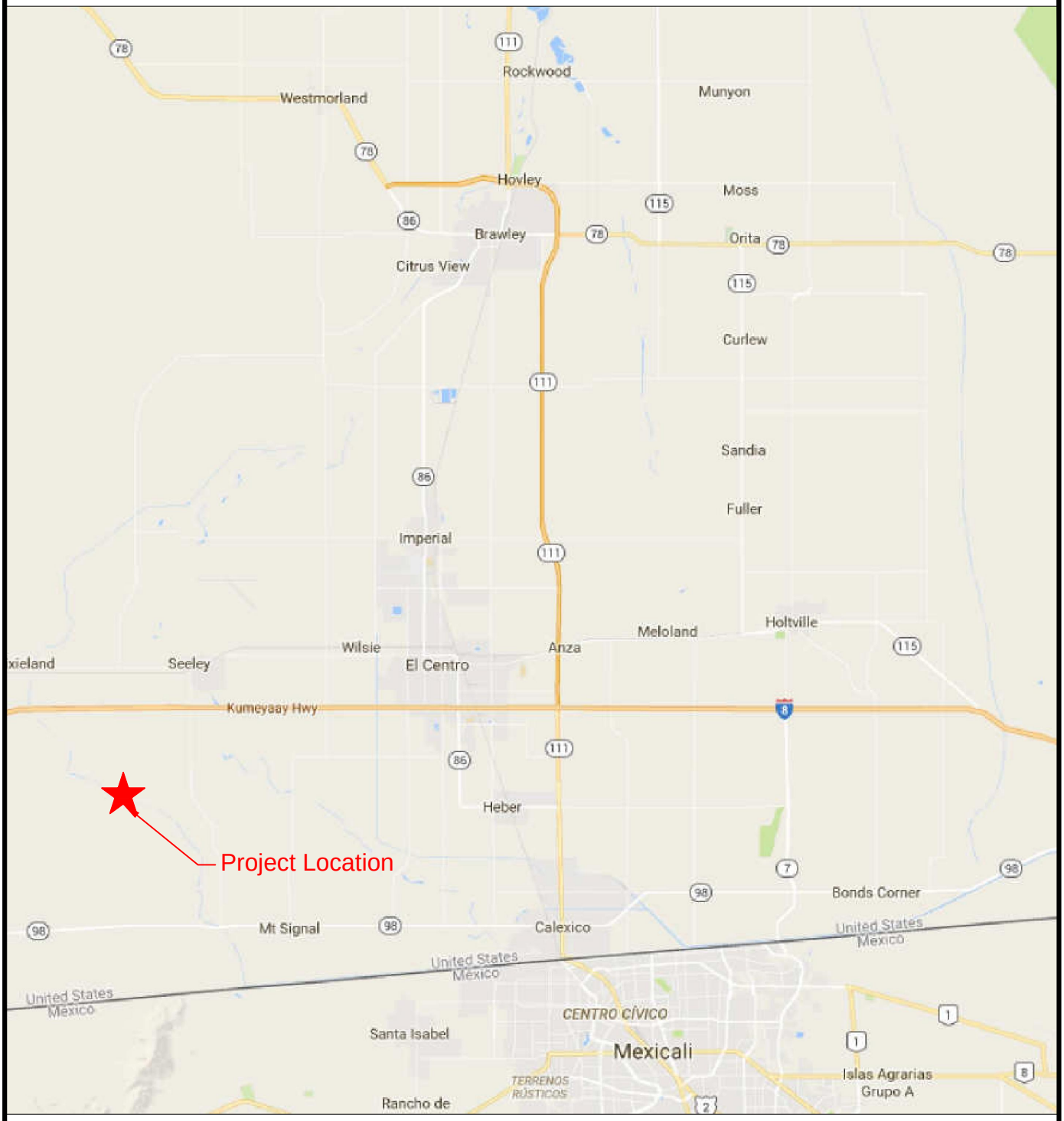
This report is valid for the earlier of one year from the date of issuance, a change in circumstances, or discovered variations. After expiration, no person or entity shall rely on this report without the express written authorization of WT.

9.0 CLOSURE

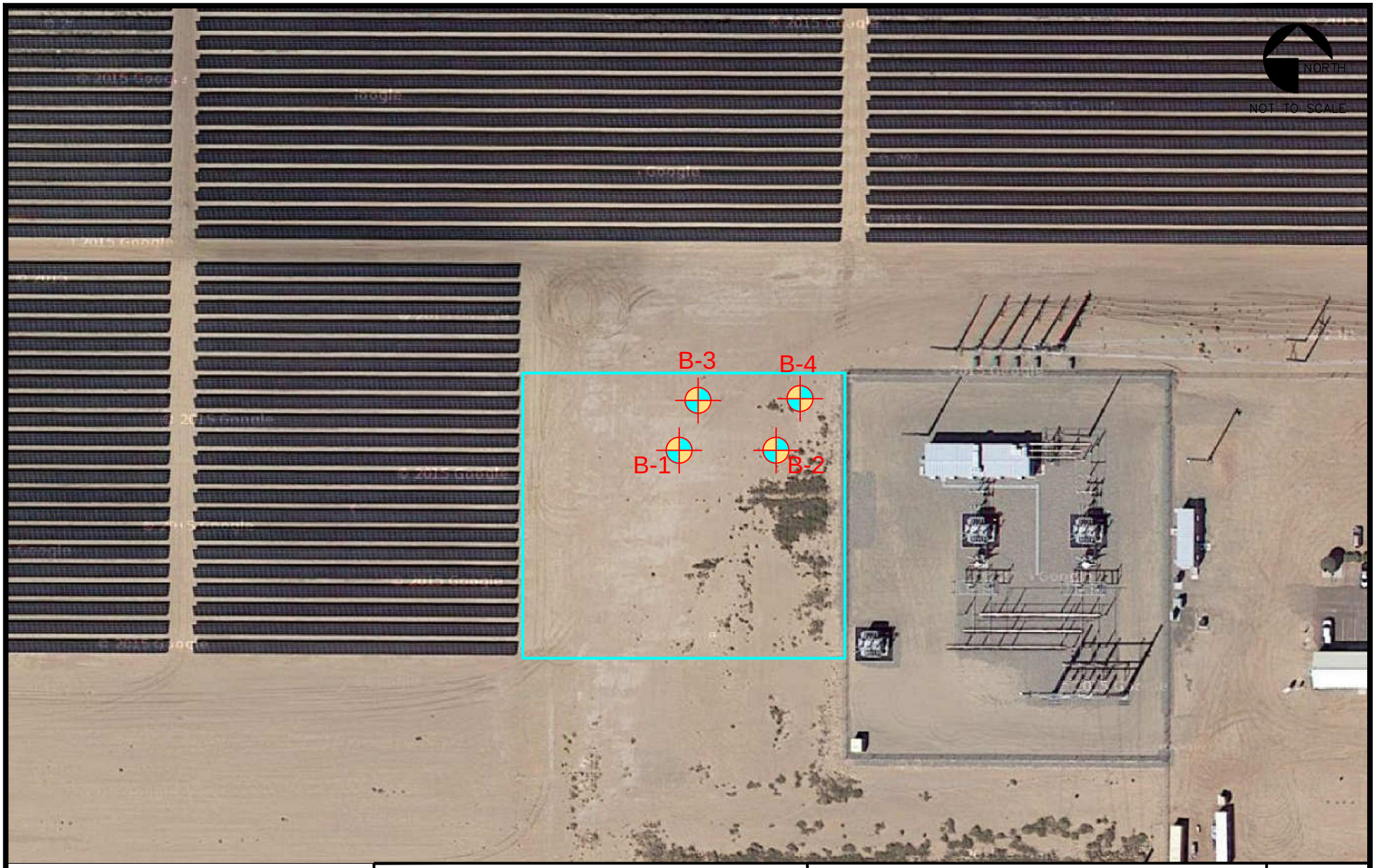
We prepared this report as an aid to the designers of the proposed project. The comments, statements, recommendations and conclusions set forth in this report reflect the opinions of the authors. These opinions are based upon data obtained at the location of the borings, and from laboratory tests. Work on this project was performed in accordance with generally accepted standards and practices utilized by professionals providing similar services in this locality. No other warranty, express or implied, is made.

NORTH

NOT TO SCALE



Geotechnical Environmental Inspections Materials Western Technologies Inc. The Quality People Since 1955	**SITE VICINITY MAP** CAMPO VERDE ENERGY STORAGE 1148 Liebert Road El Centro, California WT Job No. 2126XT095	**PLATE 1**



LEGEND

Approximate Boring Location

Project Boundary Line

Geotechnical
Environmental
Inspections
Materials

Western Technologies Inc.
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Since 1955

BORING LOCATION DIAGRAM

CAMPO VERDE ENERGY STORAGE
1148 Liebert Road
El Centro, California

WT Job No. 2126XT095

PLATE 2

Allowable Soil Bearing Capacity	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
Backfill	A specified material placed and compacted in a confined area.
Base Course	A layer of specified material placed on a subgrade or subbase.
Base Course Grade	Top of base course.
Bench	A horizontal surface in a sloped deposit.
Caisson	A concrete foundation element cast in a circular excavation which may have an enlarged base. Sometimes referred to as a cast-in-place pier.
Concrete Slabs-On-Grade	A concrete surface layer cast directly upon a base, subbase or subgrade.
Crushed Rock Base Course	A base course composed of crushed rock of a specified gradation.
Differential Settlement	Unequal settlement between or within foundation elements of a structure.
Engineered Fill	Specified material placed and compacted to specified density and/or moisture conditions under observations of a representative of a soil engineer.
Existing Fill	Materials deposited through the action of man prior to exploration of the site.
Existing Grade	The ground surface at the time of field exploration.
Expansive Potential	The potential of a soil to expand (increase in volume) due to absorption of moisture.
Fill	Materials deposited by the actions of man.
Finished Grade	The final grade created as a part of the project.
Gravel Base Course	A base course composed of naturally occurring gravel with a specified gradation.
Heave	Upward movement
Native Grade	The naturally occurring ground surface.
Native Soil	Naturally occurring on-site soil.
Rock	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
Sand and Gravel Base	A base course of sand and gravel of a specified gradation.
Sand Base Course	A base course composed primarily of sand of a specified gradation.
Scarify	To mechanically loosen soil or break down existing soil structure.
Settlement	Downward movement.
Soil	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
Strip	To remove from present location.
Subbase	A layer of specified material placed to form a layer between the subgrade and base course.
Subbase Grade	Top of subbase.
Subgrade	Prepared native soil surface.

COARSE-GRAINED SOILS

LESS THAN 50% FINES*

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE
GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES	
GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, MORE THAN 12% FINES	
GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, MORE THAN 12% FINES	
SW	WELL-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE
SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	
SM	SILTY SANDS, SAND-SILT MIXTURES, MORE THAN 12% FINES	
SC	CLAYEY SANDS, SAND-CLAY MIXTURES, MORE THAN 12% FINES	

NOTE: Coarse-grained soils receive dual symbols if they contain 5% to 12% fines (e.g., SW-SM, GP-GC).

FINE-GRAINED SOILS

MORE THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
OL	ORGANIC SILTS OR ORGANIC SILT-CLAYS OF LOW PLASTICITY	
MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTS, ELASTIC SILTS	SILTS AND CLAYS LIQUID LIMIT MORE THAN 50
CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY	
PT	PEAT, MUCK AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

NOTE: Fine-grained soils may receive dual classification based upon plasticity characteristics.

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	Above 12 in.
COBBLES	3 in. – 12 in.
GRAVEL	No. 4 – 3 in.
Coarse	3/4 in. – 3 in.
Fine	No. 4 – 3/4 in.
SAND	No. 200 – No. 4
Coarse	No. 10 – No. 4
Medium	No. 40 – No. 10
Fine	No. 200 – No. 40
*Fines (Silt or Clay)	Below No. 200

NOTE: Only sizes smaller than three inches are used to classify soils

CONSISTENCY

CLAYS & SILTS	BLOWS PER FOOT*
VERY SOFT	0 – 2
SOFT	2 – 4
FIRM	4 – 8
STIFF	8 – 16
VERY STIFF	16 – 32
HARD	Over 32

RELATIVE DENSITY

SANDS & GRAVELS	BLOWS PER FOOT*
VERY LOOSE	0 – 4
LOOSE	4 – 10
MEDIUM DENSE	10 – 30
DENSE	30 – 50
VERY DENSE	Over 50

*Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1 3/8 inch ID) split spoon (ASTM D1586).

PLASTICITY OF FINE GRAINED SOILS

PLASTICITY INDEX	TERM
0	NON-PLASTIC
1 – 7	LOW
8 – 25	MEDIUM
Over 25	HIGH

DEFINITION OF WATER CONTENT

DRY
SLIGHTLY DAMP
DAMP
MOIST
WET
SATURATED

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METHOD OF CLASSIFICATION

PLATE

A-2

The number shown in **"TEST PIT"** refers to the approximate location of the same number indicated on the "Test Pit Location Diagram" as positioned in the field by pacing or measurement from property lines and/or existing features, or through the use of Global Positioning System (GPS) devices.

"EXCAVATION TYPE" refers to the equipment type used in the excavation of the test pit, and may include the width of the bucket on the excavator.

"SAMPLE TYPE" refers to the form of sample recovery, in which **N = Split-barrel sample, R = Ring sample, G = Grab Sample, B = Bucket Sample**.

"USCS" refers to the "Unified Soil Classification System" Group Symbol for the soil type as defined by ASTM D 2487 and D 2488. The soils were classified visually in the field, and where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

These notes and test pit logs are intended for use in conjunction with the purposes of our services defined in the text. Test pit log data should not be construed as part of the construction plans nor as defining construction conditions.

The Test Pit logs depict our interpretations of subsurface conditions at the locations and on the date(s) noted. Variations in subsurface conditions and characteristics may occur between test pits. Groundwater levels may fluctuate due to seasonal variations and other factors.

The stratification lines shown on the test pit logs represent our interpretation of the approximate boundary between soil or rock types based upon visual field classification at the test pit location. The transition between materials is approximate and may be more or less gradual than indicated.

NEI
1851 W. 24th Street
85364
Telephone: 928-344-8374
Fax: 928-726-6994

BORING NUMBER B1

CLIENT Western Technologies, Inc.
PROJECT NAME Campo Verde Energy Storage
PROJECT NUMBER 016-0097
PROJECT LOCATION El Centro, Ca.
DATE STARTED 7/22/16 COMPLETED 7/22/16
GROUND ELEVATION _____ HOLE SIZE 8 inches
DRILLING CONTRACTOR NICKLAUS ENGINEERING,INC.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY MLD CHECKED BY _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Cover - Soil (SM) Silty Sand - Pale yellowish brown (10YR 6/2), loose, dry, fine sand (20%)	SS B1-2	100	7-15-28 (43)							
5		(CL) Clay - Dark yellowish brown (10YR 4/2), stiff to very stiff, moist, slightly imbibes water, non-plastic.	SS B1-5	50 (278)	2-5-9 (14)							
10			SS B1-10	100	4-10-20 (30)							

Bottom of borehole at 11.5 feet.

PROFESSIONAL GEOLOGIST
MICHAEL L. DANIEL
No. 9372
8/16/16
STATE OF CALIFORNIA

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 8/16/16 10:00 - N:\2016\016-0097 FIRST SOLAR CAMPO VERDE\FIRST SOLAR CAMPO VERDE.GPJ

NEI
1851 W. 24th Street
85364
Telephone: 928-344-8374
Fax: 928-726-6994

BORING NUMBER B2

CLIENT Western Technologies, Inc.
PROJECT NAME Campo Verde Energy Storage
PROJECT NUMBER 016-0097
PROJECT LOCATION El Centro, Ca.
DATE STARTED 7/22/16 COMPLETED 7/22/16
GROUND ELEVATION ____ HOLE SIZE 8 inches
DRILLING CONTRACTOR NICKLAUS ENGINEERING,INC.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY MLD CHECKED BY ____
AT END OF DRILLING ---
NOTES ____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Cover - Soil (SM) Silty Sand with clay - Moderate yellowish brown (10YR 5/4), loose to moderaytely hard, dry, fine sand (40%), clay<10%, small roots.	SS B1-2	100	7-15-22 (37)							
5		(CL) Clay - Dark yellowish brown (10YR 4/2), stiff, damp, slightly imbibes water, non-plastic.	SS B1-5	100	3-7-14 (21)							
10			SS B1-10	100	3-9-21 (30)							
15			SS	100	6-21-26 (47)							
		(SM) Silty Sand - Dark yellowish brown (10YR 4/2), fine grained, moderately to well sorted, hard, saturated, silt 30%.										

Water was evident at 11 feet on downhole rod. Sample at 10 feet bgs was damp, therefore the water on the rod was likely due to confined conditions forcing water into boring. First water likely at approximately 16 feet bgs.

Bottom of borehole at 16.5 feet.

PROFESSIONAL GEOLOGIST
MICHAEL L. DANIEL
No. 9372
8-16-16
STATE OF CALIFORNIA

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 8/16/16 09:59 - N:\2016\016-0097 FIRST SOLAR CAMPO VERDE\FIRST SOLAR CAMPO VERDE.GPJ

NEI
1851 W. 24th Street
85364
Telephone: 928-344-8374
Fax: 928-726-6994

BORING NUMBER B3

CLIENT Western Technologies, Inc.
PROJECT NAME Campo Verde Energy Storage
PROJECT NUMBER 016-0097
PROJECT LOCATION El Centro, Ca.
DATE STARTED 7/22/16 **COMPLETED** 7/22/16
GROUND ELEVATION _____ **HOLE SIZE** 8 inches
DRILLING CONTRACTOR NICKLAUS ENGINEERING,INC.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY MLD **CHECKED BY** _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Cover - Soil										
		(SM) Silty Sand with clay - Moderate yellowish brown (10YR 5/4), loose, moist, fine sand (30%), moderately sorted, clay (<10%) soft, damp, non-plastic.										
5												

Bottom of borehole at 5.0 feet.

PROFESSIONAL GEOLOGIST
MICHAEL L. DANIEL
No. 9372
8-16-16
STATE OF CALIFORNIA

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 8/16/16 09:59 - N:\2016\016-0097 FIRST SOLAR CAMPO VERDE\FIRST SOLAR CAMPO VERDE.GPJ

NEI
1851 W. 24th Street
85364
Telephone: 928-344-8374
Fax: 928-726-6994

BORING NUMBER B4

CLIENT Western Technologies, Inc.
PROJECT NAME Campo Verde Energy Storage
PROJECT NUMBER 016-0097
PROJECT LOCATION El Centro, Ca.
DATE STARTED 7/22/16 COMPLETED 7/22/16
GROUND ELEVATION _____ HOLE SIZE 8 inches
DRILLING CONTRACTOR NICKLAUS ENGINEERING,INC.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY MLD CHECKED BY _____
AT END OF DRILLING ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		Cover - Soil										
		(SM) Silty Sand with clay - Pale yellowish brown (10YR 6/2), loose, damp, fine sand (30%), moderately sorted, clay (<10%) soft, damp, non-plastic.										
5												

Bottom of borehole at 5.0 feet.

PROFESSIONAL GEOLOGIST
MICHAEL L. DANIEL
No. 9372
8-16-16
STATE OF CALIFORNIA

GEOTECH BH COLUMNS - GINT STD US LAB.GDT - 8/16/16 09:57 - N:\2016\016-0097 FIRST SOLAR CAMPO VERDE\FIRST SOLAR CAMPO VERDE.GPJ

Boring No.	Depth (ft.)	USCS Class.	Initial Dry Density (pcf)	Initial Water Content (%)	Compression Properties			Swell Properties		Plasticity		Percent Passing #200	Soluble		Remarks
					Surcharge (ksf)	Total Compression (%)		Surcharge (ksf)	Expansion Index	LL	PI		Sulfate (ppm)	Chloride (ppm)	
						In-Situ	After Saturation								
1	0-5	SM							0	--	NP	26.5			2, 5
1	2-3	SM	101.6	10.4	1.0	0.7									
					2.0	1.0	1.3								2
					3.0		1.5								2
2	0-5	CL								24	9	56.3			
2	2-3	CL	102.8	11.4	1.0	0.9									
					2.0	1.2	1.6								2
					3.0		1.9								2
3	0-5	SM								--	NP	32.5			

Notes: Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.
NP = Non-Plastic

Remarks

1. Compacted density (approx. 95% of ASTM D698 max. density at moisture content slightly below optimum.)
2. Submerged to approximate saturation.
3. Slight rebound after saturation.
4. Sample disturbance observed.
5. Expansion Index (EI) test in accordance with ASTM D4829

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PROJECT: **CAMPO VERDE ENERGY STORAGE**
JOB NO.: **2126XT095**

SOIL PROPERTIES

PLATE **B-1**

Boring No.	Depth (ft)	Moisture Content	pH[1]	Soluble Chloride[2] (ppm)	Soluble Sulfate[3] (ppm)	Minimum Resistivity[4] (Ohm-Cm)
1	0-5		8.5	118	169	934
2	0-5					514

[1] pH (ARIZ 237b)
[2] Chloride Content (ARIZ 736a)
[3] Sulfate Content (ARIZ 733a)
[4] Minimum Resistivity (ARIZ 236c)

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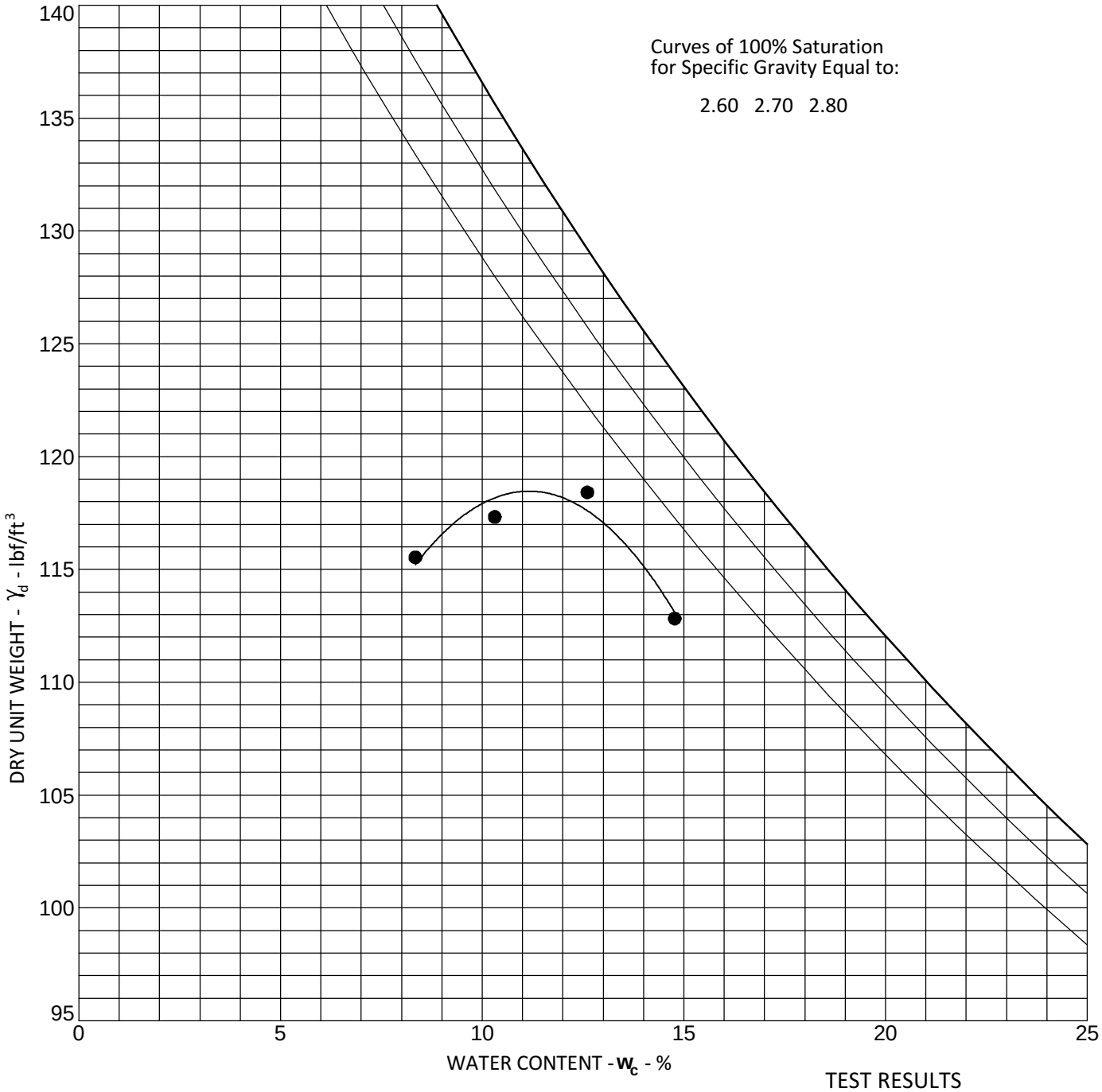
JOB NO.: 2126XT095

PLATE
B-2

SOIL PROPERTIES

LABORATORY COMPACTION CHARACTERISTICS - STANDARD EFFORT



Source of Material	**B-1 at 2.5 ft**
Description of Material	**Silty SAND**
	26.5% Passing the No. 200 Sieve
Test Method	**ASTM D698 Method A**

ATTERBERG LIMITS

LL	PL	PI
--	NP	--

TEST RESULTS

Maximum Dry Density	**118.6** PCF
Optimum Water Content	**12.1** %

ASTM Rock Corrected Maximum Dry Density= 120.6 pcf at 12.1% Moisture Content

Geotechnical Environmental Inspections Materials

Western Technologies Inc.
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PROJECT: **CAMPO VERDE ENERGY STORAGE**
LOCATION: **EL CENTRO, CALIFORNIA**
PROJECT NO.: **2126XT095**

COMPACTION CURVE

PLATE

B-3

ADDENDUM NO. 1

Western Technologies Inc.
The Quality People
Since 1955

3737 East Broadway Road
Phoenix, Arizona 85040-2921
(602) 437-3737 • *wt-us.com*

Revised September 28, 2016

Renewable Energy Systems Americas, Inc. (RES)
11101 West 120th Avenue
Broomfield, CO 80021

Attn: Brendan D. Miller, P.E.

Re: Additional Project Information — WT Job No. 2126XT095
CAMPO VERDE PHASE I AND PHASE II ENERGY STORAGE PROJECT — **Addendum No. 1**
1148 Leibert Road
El Centro, California

Western Technologies Inc. (WT) completed the geotechnical evaluation for the referenced project. The results of our evaluation were provided in our report dated August 16, 2016. We understand that the project may change, and additional information is available for the updated project description.

Based on the new information shown on the *Site Layout Plan Phase II:40MW/80MWH* dated May 24, 2016 and provided in emails, the proposed 164-foot by 53-foot prefabricated metal enclosure will consist of a slab-on-grade with 500 psf slab loading and 16 battery supports with 50 kip loads at the corners and 20 kip loads in the remaining field of the battery racks. Additional concrete slabs will be constructed for adjacent equipment pads with maximum weights of about 600 psf and minimum areas of about 16 square feet.

We understand that the proposed metal enclosure will be supported on a mat foundation with perimeter and interior thickened sections. The interior thickened slab sections will occur at the locations of the point loads from the battery racks. The maximum allowable bearing pressure applicable beneath stiffening ribs, thickened slab areas, and perimeter beams is 2000 psf. If a uniform thick foundation is used then the maximum allowable bearing pressure across the entire width when founded within the upper one foot is 1250 psf. Deflections in the mat foundation can be calculated using the modulus of subgrade reaction of 225 pounds-per-cubic-inch.

We still anticipate that differential settlement of the proposed structure, supported as recommended, should be less than ¾ of an inch. Additional foundation or slab movements could occur if water from any source infiltrates the foundation soils. Therefore, proper drainage should be provided in the final design and during construction.

If the enclosure is supported on a mat/slab foundation, then the earthwork for the site preparation should be as described in Section 7.5 of the report: *scarify, moisten or dry as required, and compact all subgrade soils to a minimum depth of 10 inches. The subgrade preparation is to be accomplished in a manner that will result in uniform water contents and densities after compaction.*

All other applicable recommendations presented in the referenced geotechnical evaluation will still apply. We prepared this Addendum as an aid to the designers of the proposed project. The comments, statements, recommendations and conclusions set forth in this letter reflect the opinions of the author. These opinions are based upon data obtained at the location of the borings, and from laboratory tests for the original evaluation and the additional project information recently supplied. Work on your project was performed in accordance with generally accepted standards and practices utilized by professionals providing similar services in this locality. No other warranty, express or implied, is made.

If you have any questions regarding these recommendations, please do not hesitate to call us at 602-437-3737.

Sincerely,
WESTERN TECHNOLOGIES INC.
Preconstruction/Design Services

Eddy F. Ramirez, E.I.T.
Staff Engineer

Randolph Marwig, P.E.
Senior Engineer

Copies: Addressee